APPENDIX I

FALL 2010 OFFSHORE ENVIRONMENTAL SAMPLING REPORT FOR THE ROCKAWAY DELIVERY LATERAL PROJECT

Fall 2010
Offshore
Environmental Sampling Report
for the Rockaway Delivery Lateral Project
Queens, New York

November 2011

Prepared for:

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Public

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List of Abbreviations and Acronyms

BOD	biological oxygen demand
BTEX	Benzene, Toluene, Xylene
COD	chemical oxygen demand
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DO	dissolved oxygen
°C	degrees Celsius
E & E	Ecology and Environment, Inc.
FERC	Federal Energy Regulatory Commission
H	Shannon's Diversity Index
HDD	horizontal directional drill
mg/L	milligrams per liter
mL	milliliter
MLLW	mean lower low water
MMcfd	million cubic feet per day
NPS	National Park Service (U.S. Department of the Interior)
NTU	Nephelometric Turbidity Units
NYSDEC	New York State Department of Environmental Conservation
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls

List of Abbreviations and Acronyms (cont.)

PCDD	polychlorinated dibenzo-dioxin
PCDF	polychlorinated dibenzo-furan
ppt	parts per thousand
SVOC	semi-volatile organic compound
TBTA	Tri-borough Bridge and Tunnel Authority
TCDD	Tetrachlorodibenzo-p-dioxin
TOC	total organic carbon
TOGS	Technical and Operational Guidance Series
Transco	Transcontinental Gas Pipe Line Company, LLC
TSS	total suspended solids
VOC	volatile organic compound

1 Introduction

Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), is preparing to file an application with the Federal Energy Regulatory Commission (FERC) seeking all of the necessary authorizations pursuant to the Natural Gas Act to construct and operate a new lateral on its existing natural gas pipeline system. This new lateral will provide an additional delivery point to National Grid US's local distribution companies of Brooklyn Union Gas Company, D/B/A National Grid NY and KeySpan Gas East Corporation (herein referred to as "National Grid") in the New York City market area. The Rockaway Delivery Lateral Project (the Project) will enhance reliability and position National Grid to serve growth by providing an additional delivery point into their system. The Project is currently under review through the FERC Pre-Filing process, following approval of Transco's request letter dated March 13, 2009 (Docket No. PF09-8). The Pre-Filing process allows Transco to obtain resource agency and stakeholder input prior to filing of the formal FERC application under Section 7 of the Natural Gas Act. The FERC application for the Project requires the submittal of 12 Resource Reports, with each report evaluating Project effects on a particular aspect of the environment. This Environmental Sampling Report has been prepared in support of the Pre-Filing outreach and Resource Report composition efforts.

The proposed pipeline would consist of approximately 3.2 miles of 26-inch diameter pipeline from a proposed offshore interconnect with Transco's existing Lower New York Bay Extension, in the Atlantic Ocean seaward of Rockaway Peninsula, to an onshore delivery point into the National Grid pipeline system on the Rockaway Peninsula in Queens County, New York, as shown on Figure 1-1. Construction of the pipeline would allow the input of up to 625 MMcfd to National Grid's regional distribution system and would support the City of New York's clean air initiatives, which will limit the use of high sulfur oils.

Transco proposes to cross the beach and install the nearshore portion of the pipeline using a Horizontal Directional Drill (HDD). The proposed HDD would be approximately 0.58 miles long. The remaining 2.58 miles of the offshore segment would be installed using conventional marine lay and trenching methods. The 0.34-mile onshore segment of the pipeline primarily extends beneath a pitch-and-putt golf course located within the Jacob Riis Park to a proposed tie-in point with National Grid to be located within the Tri-borough Bridge and Tunnel Authority (TBTA) right-of-way. Beach 169th Street and Fort Tilden are located to the west of the proposed pipeline. A parking lot and additional land within Jacob Riis Park are located to the east. Jacob Riis Park and Fort Tilden are part of Gateway National Recreation Area, which is managed by the National Park Service (NPS). Transco is also proposing to construct a meter and regulating (M&R) station in the southernmost historic airplane hangars (Hangars 1 and 2) at Floyd Bennett Field. Jacob Riis Park, Fort Tilden and Floyd Bennett Field are part of Gateway National Recreation Area, which is managed by the NPS. National Grid would be responsible for constructing the pipeline between the M&R station at Floyd Bennett Field and the tie-in point in Jacob Riis Park.

Scope of Work

Ecology and Environment, Inc. (E & E) was contracted by Transco to support the environmental compliance/permitting requirements for the Project. In order for the FERC process, certificates and, ultimately, the installation processes to move forward, it was necessary to evaluate the physical, chemical, and biological characteristics along the proposed pipeline route. Prior to undertaking the field activities, a sampling and analysis plan was prepared and submitted to regulatory agencies to provide them with the opportunity to comment on and, if necessary, request modifications to ensure adequacy of data for the agency review. The Sampling and Analysis Plan (Plan) prepared for the Project is provided in Appendix A.

Previous Investigation

An initial field sampling effort took place from June 23 through July 13, 2009 along the originally-proposed pipeline route (Figure 1-1) (E & E 2009). After review of the 2009 survey results, Transco determined that shifting the proposed pipeline corridor to the south would reduce the potential for impacts to hardbottom habitat (i.e., artificial reef structures and anthropogenic debris), which supports colonies of northern star coral (*Astrangia poculata*), and historic resources (i.e., shipwrecks). Therefore, two new offshore pipeline routes were identified for investigation (one preferred and one alternative).

Recent Surveys

A second field sampling effort took place between November 21 and December 10, 2010 to survey the two new pipeline routes associated with the Project. A summary of the field data collected as part of the second (2010) sampling effort in the Atlantic Ocean is provided below. Sampling and analysis methods generally adhered to the 2009 Plan, unless otherwise described in this report. Although geotechnical, archaeological and deep sediment core data were collected and analyzed as part of this field effort, this report presents only the results supporting the biological and water quality evaluations for the Project. Geotechnical boring logs will be provided as appendices to Resource Report 7, Soils, of the FERC Environmental Report, and the results of archaeological

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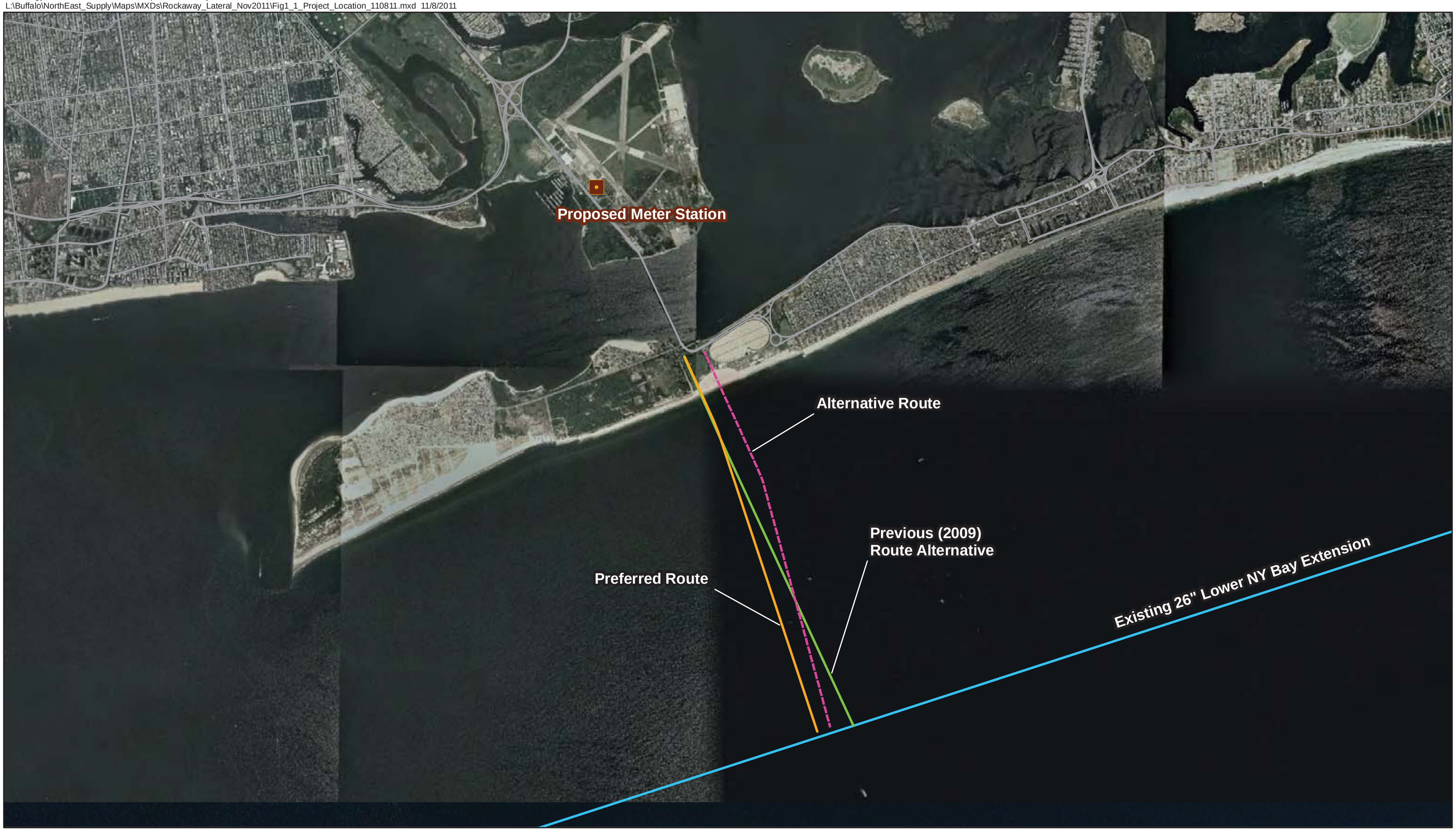

0 0.25 0.5 1 1.5 Miles

Source: ESRI 2010; Mustang 2011.

Figure 1-1
Rockaway Delivery Lateral Project Location
Lower New York Bay
Williams Transco

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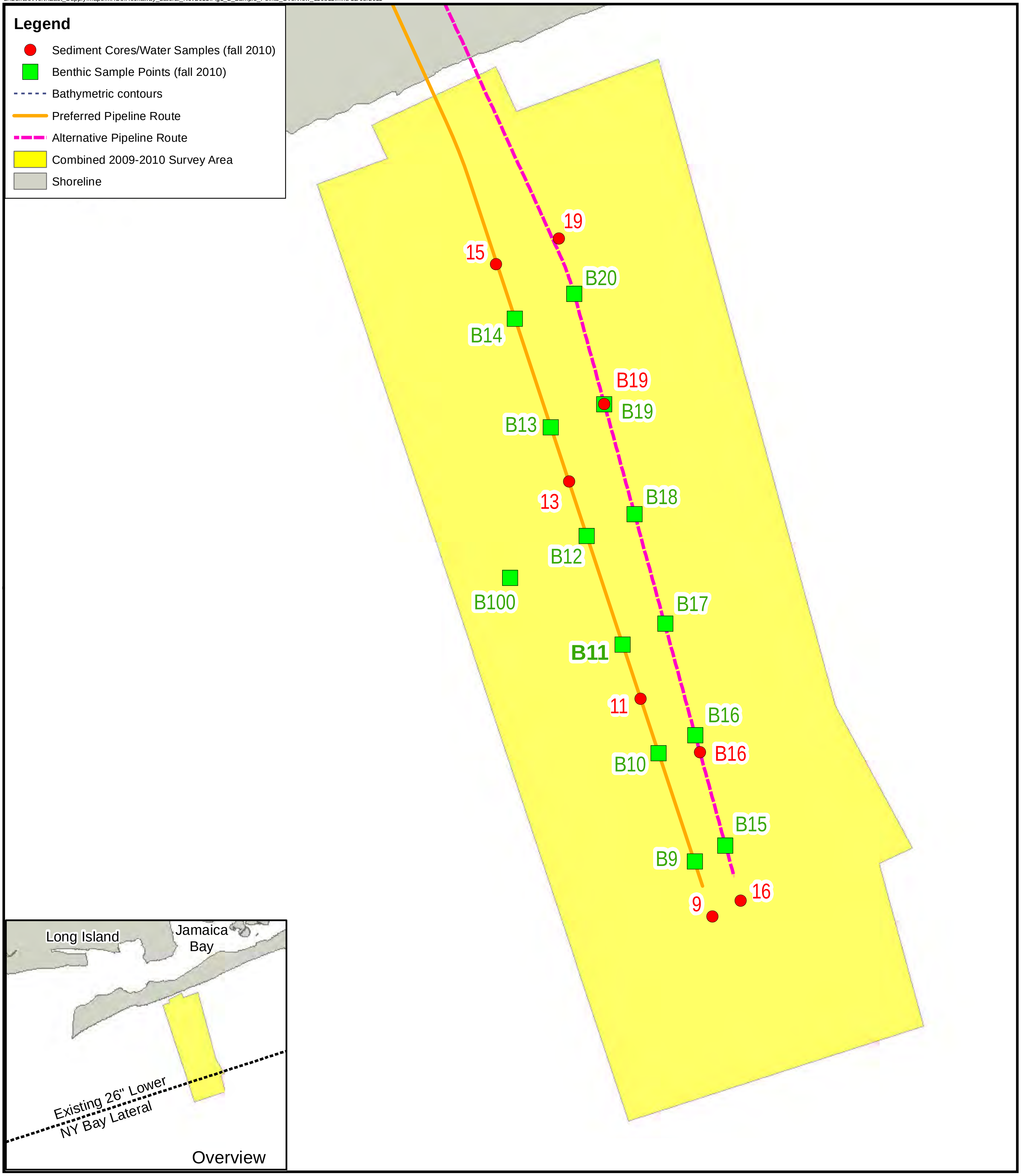

Source: ESRI 2008; NOAA 2008; PBS&J 2009

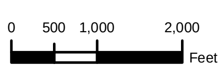

Figure 1-2
Sediment/Water Quality and Benthic Sampling Locations
Fall 2010 Field Survey
Rockaway Delivery Lateral
Williams Transco

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investigations will be presented in Resource Report 4, Cultural Resources. Transco anticipates submitting these Resource Reports to FERC in Spring 2012.

This report discusses all environmental field parameters collected, including:

- Sediment chemical contamination;
- Physical and chemical water quality parameters;
- Benthic community analysis; and
- Drop camera video of the proposed pipeline route.

The appendices at the end of this report provide all field data collected as part of the 2010 sampling effort. Appendix A presents the Sampling and Analysis Plan developed in 2009 for the data collection effort; Appendix B presents the laboratory results for all chemical parameters analyzed; Appendix C presents the Marine Biology Report that discusses the results of the benthic sampling and subsurface video performed at each sample location; Appendix D contains a CD including the raw video collected with the drop camera.

2 Sediment Sampling Results

The sediment sampling plan developed to evaluate the site-specific sediment conditions along the proposed pipeline route was designed specifically to address the New York State Department of Environmental Conservation's (NYSDEC's), Technical and Operational Guidance Series (TOGS) 5.1.9 for In-Water and Riparian Management of Sediment and Dredged Material (November 2004). The TOGS was produced by the NYSDEC Division of Water and Division of Fish/Wildlife and Marine Resources to provide guidance on the statutory and regulatory requirements for dredging activities and to promote uniformity in the certification and/or permitting of dredging projects in the state of New York. The sediment sampling plan includes analysis of sediment samples for several chemicals that would be of concern if found above threshold levels. The TOGS threshold values reflect toxicity to aquatic life.

Samples were collected at four (4) locations along both the preferred and alternative pipeline routes (total of 8 locations) (see Figure 1-2). Sediment sampling was performed through a coring operation in which a sediment core was collected from each sampling location using a vibracore unit mounted on the survey vessel. There was no specific depth for the sampling; instead, the goal was to retain a core length of 10 feet. Once retrieved, the sediment core soil types were classified, and sediment samples were collected from the core and shipped to a laboratory for chemical analysis. Each core was separated into increments, with approximate intervals of 0 to 1 foot, 1 to 4 feet, and 4 feet to the bottom of the core. Most cores were driven to a total depth of 10 feet below the seafloor; however, recoveries were less due to refusal or poor sample recovery. The deepest samples were collected at a depth ranging from 4 to 7 feet below the seafloor. Samples were collected from eight locations on December 2 and 3, 2010. A total of 22 samples were collected, as identified in Table 2-1 below. The tests performed, method, and quantities of samples collected are summarized in Table 2-2, which is based upon the NYDEC TOGS 5.1.9 for chemicals known to be both toxic and persistent in New York. Upon completion of the analyses, positive results were evaluated and compared to the TOGS criteria (see Tables 2-3 and 2-4, preferred and alternative routes, respectively). The results are discussed below, and the complete analytical results are provided in Appendix B.

Table 2-1 Sediment Sample Identification Numbers

Location	Sample ID 0- to 1-Foot Increment	Sample ID 1- to 4-Foot Increment	Sample ID 4- to 7-Foot Increment	Sample ID 7- to 10-Foot Increment
09	09-D0-1E	09-D1-4	09-D4-6E	NS*
11	11-D0-1E	11-D1-4E	11-D4-6E	NS
13	13-D0-1E	13-D1-4	NS	NS
15	15-D0-1E	15-D1-4E	15-D4-6E	NS
16	16-D0-1E	16-D1-4E	16-D4-6E	NS
B16	B16-D0-1E	B16-D1-4E	B16-D4-5E	NS
19	19-D0-1E	19-D1-4E	19-D4-7	NS
B19	B19-D0-1E	B19-D1-4E	NS	NS

*NS = No Sample

Table 2-2 Summary of Sediment Chemical Analyses

Test Description*	EPA Method Number	TOGS 5.1.9 Required Method Detection Limit (mg/Kg)	TOGS 5.1.9 Class A Threshold** (mg/Kg dry weight)
Arsenic	EPA 6010B	3.0	8.2
Cadmium	EPA 6010B	1.0	1.2
Copper	EPA 6010B	5.0	33
Lead	EPA 6010B	2.0	47
Mercury	EPA 6010B	0.2	0.17
Benzene	EPA 8260B	0.0003	0.59
Total BTEX (Benzene, Toluene, Xylene)	EPA 8260B	0.0008	0.96
Total PAHs (sum of Target Compound List PAH)	EPA 8270C	0.33	4.0
Sum of DDT+DDE+DDD	EPA 8081A	0.0033	0.0030
Mirex	EPA 8081A	0.189	0.0014
Chlordane	EPA 8081A	0.0017	0.0030
Dieldrin	EPA 8081A	0.0033	0.11
PCBs (sum of Aroclors)	EPA 8082	0.033	0.10
Dioxin (sum of TCDD toxic equivalency)	EPA 1613B	0.000002	0.0000045
Total Organic Carbon (TOC)	EPA 9060	N/A	N/A
pH	EPA 9045C	N/A	N/A
Salinity		N/A	N/A
% Moisture	SM 2540	N/A	N/A

* For compounds that were not detected, all total/sum results were calculated by adding the value of the detection limit as a conservative estimate.

** Values below the Class A threshold represent no appreciable contamination.

Table 2-3 Summary of Analytical Results for Sediment Samples along the Preferred Pipeline Route, Fall 2010

Analyte	Threshold(1)	DL(2)	Sample 9-D0-1E	Q	Sample 9-D1-4E	Q	Sample 9-D4-6E	Q	Sample 11-D0-1E	Q	Sample 11-D1-4E	Q	Sample 11-D4-6E	Q	Sample 13-D0-1E	Q	Sample 13-D1-4E	Q	Sample 15-D0-1E	Q	Sample 15-D1-4E	Q	Sample 15-D4-6E	Q
Volatiles by 8260B [µg/Kg (ppb)]																								
Benzene	590	2	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.10	ND	0.09	ND
p/m-Xylene	N/A	N/A	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	0.90	ND
o-Xylene	N/A	N/A	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	0.90	ND
Toluene	N/A	N/A	1.00	ND	1.00	ND	1.00	ND	1.00	ND	2.00	J	1.00	ND	1.00	ND	1.00	ND	1.00	ND	1.00	ND	0.90	ND
Total BTX	960	2	3.10	ND	3.10	ND	3.10	ND	3.10	ND	4.10	J	3.10	ND	3.10	ND	3.10	ND	3.10	ND	3.10	ND	2.79	ND
Semivolatiles by 8270D [µg/Kg (ppb)]																								
2-Chloronaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Acenaphthylene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Anthracene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Benz(a)anthracene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Benzo(a)pyrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Benzo(b)fluoranthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Benzo(ghi)perylene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Benzo(k)fluoranthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Chrysene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Dibenz(a,h)anthracene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Fluoranthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Fluorene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Indeno(1,2,3-cd)pyrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Naphthalene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Phenanthrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Pyrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	41.0	ND	42.0	ND	44.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND
Total PAH	4000	330	688	ND	672	ND	672	ND	688	ND	656	ND	672	ND	704	ND	672	ND	688	ND	704	ND	688	ND
Pesticides by 8081A [µg/Kg (ppb)]																								
4,4'-DDD	N/A	N/A	0.17	ND	0.16	ND	0.16	ND	0.17	ND	0.16	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND
4,4'-DDE	N/A	N/A	0.17	ND	0.50	J	0.16	ND	0.29	J	0.16	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND
4,4'-DDT	N/A	N/A	0.17	ND	0.16	ND	0.16	ND	0.17	ND	0.16	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND
Sum of DDT+DDE+DDD	3	29	0.510	ND	0.820	ND	0.480	ND	0.630	ND	0.480	ND	0.510	ND	0.510	ND	0.510	ND	0.510	ND	0.510	ND	0.510	ND
Technical Chlordane	3	31	2.10	ND	2.00	ND	2.00	ND	2.00	ND	2.00	ND	2.00	ND	2.10	ND	2.00	ND	2.10	ND	2.10	ND	2.00	ND
Dieldrin	110	19	0.65	J	0.72	J	0.16	ND	0.55	J	0.16	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.17	ND
Mirex	1.4	189	0.18	ND	0.17	ND	0.17	ND	0.18	ND	0.17	ND	0.18	ND	0.18	ND	0.18	ND	0.18	ND	0.19	ND	0.18	ND
PCBs by 8082 [µg/Kg (ppb)]																								
Aroclor 1016	N/A	N/A	4.20	ND	4.10	ND	4.10	ND	4.20	ND	4.10	ND	4.20	ND	4.30	ND	4.20	ND	4.20	ND	4.40	ND	4.20	ND
Aroclor 1221	N/A	N/A	6.40	ND	6.20	ND	6.20	ND	6.40	ND	6.20	ND	6.40	ND	6.60	ND	6.30	ND	6.40	ND	6.60	ND	6.40	ND
Aroclor 1232	N/A	N/A	6.70	ND	6.50	ND	6.50	ND	6.60	ND	6.40	ND	6.60	ND	6.80	ND	6.60	ND	6.70	ND	6.90	ND	6.60	ND
Aroclor 1242	N/A	N/A	6.40	ND	6.20	ND	6.20	ND	6.40	ND	6.20	ND	6.40	ND	6.60	ND	6.30	ND	6.40	ND	6.60	ND	6.40	ND
Aroclor 1248	N/A	N/A	4.20	ND	4.10	ND	4.10	ND	4.20	ND	4.10	ND	4.20	ND	4.30	ND	4.20	ND	4.20	ND	4.40	ND	4.20	ND
Aroclor 1254	N/A	N/A	4.20	ND	4.10	ND	4.10	ND	4.20	ND	4.10	ND	4.20	ND	4.30	ND	4.20	ND	4.20	ND	4.40	ND	4.20	ND
Aroclor 1260	N/A	N/A	4.20	ND	4.10	ND	4.10	ND	4.20	ND	4.10	ND	4.20	ND	4.30	ND	4.20	ND	4.20	ND	4.40	ND	4.20	ND
Total Aroclor	100	25	18.2	ND	35.3	ND	35.3	ND	36.2	ND	35.2	ND	36.2	ND	37.2	ND	36.0	ND	36.3	ND	37.7	ND	36.2	ND
% Moisture	NA	NA	22.0		19.9		19.9		21.7		18.9		21.5		23.7		20.9		22.2		24.5		21.6	
Metals by 6010B [mg/Kg (ppm)]																								
Arsenic	8.2	1	3.34		3.60		3.37		2.52		3.87		3.22		2.11	J	3.82		2.37	J	2.14	J	1.64	J
Cadmium	1.2	0.5	0.18	ND	0.17	ND	0.17	ND	0.17	J	0.23	J	0.25	J	0.18	ND	0.27	J	0.18	ND	0.18	ND	0.17	ND
Copper	33	2.5	1.23	J	0.27	ND	1.48		1.87		2.12		1.54		1.04	J	1.90		0.93	J	0.86	J	0.75	J
Lead	47	5	4.90		2.99		2.58		7.13		2.42		2.74		2.29		2.23		3.20		2.28		1.55	J
Mercury	0.17	0.2	0.0037	ND	0.0034	ND	0.0035	ND	0.224		0.0037	ND	0.0035	ND	0.0036	ND	0.0035	ND	0.0035	ND	0.0036	ND	0.0035	ND
% Moisture	NA	NA	25.1		19.9		19.8		17.8		24.5		21.0		23.7		21.2		22.0		23.5		19.9	

(1) = NYSDEC TOGS 5.1.9 Class A Threshold for no appreciable concentration

(2) = NYSDEC required detection limit

Key:

µg/Kg = Micrograms per kilogram	B = Detected in method bank
mg/Kg = Milligrams per kilogram	J = Estimated concentration (above detection limit but below quantitative reporting limit)
ng/Kg = Nanograms per kilogram	ND = Not detected
Q = Estimated Maximum Possible Concentration (EMPC)	NS = Not sampled

Table 2-4 Summary of Analytical Results for Sediment Samples along the Alternative Pipeline Route, Fall 2010

Analyte	Threshold[1]	DL[2]	Sample 16-D0-1E	Q	Sample 16-D1-4E	Q	Sample 16-D4-6E	Q	Sample B16-D0-1E	Q	Sample B16-D1-4E	Q	Sample B16-D4-5E	Q	Sample B19-D0-1E	Q	Sample B19-D1-4E	Q	Sample 19-D0-1E	Q	Sample 19-D-1-4E	Q	Sample 19-D4-7E	Q
Volatiles by 8260B [µg/Kg (ppb)]																								
Benzene	590	2	0.10	ND	0.10	ND	0.10	ND	0.10	ND	6.00	ND	0.10	ND	0.10	ND	6.00	ND	0.10	ND	0.10	ND	0.10	ND
p/m-Xylene	N/A	N/A	1.00	ND	1.00	ND	1.00	ND	1.00	ND	59.0	ND	1.00	ND	1.00	ND	58.0	ND	1.00	ND	1.00	ND	1.00	ND
o-Xylene	N/A	N/A	1.00	ND	1.00	ND	1.00	ND	1.00	ND	59.0	ND	1.00	ND	1.00	ND	58.0	ND	1.00	ND	1.00	ND	1.00	ND
Toluene	N/A	N/A	1.00	ND	1.00	ND	1.00	ND	3.00	J	59.0	ND	1.00	ND	1.00	ND	58.0	ND	1.00	ND	1.00	ND	1.00	ND
Total BTX	960	2	3.10	ND	3.10	ND	3.10	ND	5.10	J	183.0	ND	3.10	ND	3.10	ND	180.0	ND	3.10	ND	3.10	ND	3.10	ND
Semivolatiles by 8270D [µg/Kg (ppb)]																								
2-Chloronaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-Methylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Acenaphthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Acenaphthylene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Anthracene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Benz(a)anthracene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Benzo(a)pyrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Benzo(b)fluoranthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Benzo(ghi)perylene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Benzo(k)fluoranthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Chrysene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Dibenz(a,h)anthracene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Fluoranthene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Fluorene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Indeno(1,2,3-cd)pyrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Naphthalene	N/A	N/A	43.0	ND	53.0	J	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Phenanthrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Pyrene	N/A	N/A	43.0	ND	42.0	ND	42.0	ND	43.0	ND	42.0	ND	43.0	ND	44.0	ND	43.0	ND	41.0	ND	41.0	ND	41.0	ND
Total PAH	4000	330	688	ND	683	ND	672	ND	688	ND	672	ND	688	ND	704	ND	688	ND	656	ND	656	ND	656	ND
Pesticides by 8081A [µg/Kg (ppb)]																								
4,4'-DDD	N/A	N/A	0.50	ND	0.17	ND	0.29	J	0.17	ND	0.16	ND	0.17	ND	0.18	ND	0.17	ND	0.16	ND	0.16	ND	0.16	ND
4,4'-DDE	N/A	N/A	1.10		0.71	J	0.17	ND	0.17	ND	0.16	ND	0.17	ND	0.18	ND	0.17	ND	0.16	ND	0.16	ND	0.16	ND
4,4'-DDT	N/A	N/A	0.17	ND	0.17	ND	0.17	ND	0.17	ND	0.16	ND	0.17	ND	0.18	ND	0.17	ND	0.16	ND	0.16	ND	0.16	ND
Sum of DDT+DDE+DDD	3	29	1.770	ND	1.050	ND	0.630	ND	0.510	ND	0.480	ND	0.510	ND	0.540	ND	0.510	ND	0.480	ND	0.480	ND	0.480	ND
Technical Chlordane	3	31	2.10	ND	2.00	ND	2.00	ND	2.10	ND	2.00	ND	2.10	ND	2.10	ND	2.10	ND	2.00	ND	1.90	ND	2.00	ND
Dieldrin	110	19	0.87	ND	0.53	J	0.17	ND	0.17	ND	0.16	ND	0.17	ND	0.18	ND	0.17	ND	0.16	ND	0.16	ND	0.16	ND
Mirex	1.4	189	0.18	ND	0.18	ND	0.18	ND	0.18	ND	0.17	ND	0.18	ND	0.19	ND	0.18	ND	0.17	ND	0.17	ND	0.17	ND
PCBs by 8082 [µg/Kg (ppb)]																								
Aroclor 1016	N/A	N/A	4.20	ND	4.20	ND	4.10	ND	4.20	ND	4.10	ND	4.30	ND	4.40	ND	4.30	ND	4.10	ND	4.00	ND	4.10	ND
Aroclor 1221	N/A	N/A	6.40	ND	6.30	ND	6.30	ND	6.40	ND	6.20	ND	6.50	ND	6.70	ND	6.50	ND	6.20	ND	6.10	ND	6.20	ND
Aroclor 1232	N/A	N/A	6.70	ND	6.60	ND	6.50	ND	6.70	ND	6.50	ND	6.70	ND	6.90	ND	6.70	ND	6.40	ND	6.30	ND	6.40	ND
Aroclor 1242	N/A	N/A	6.40	ND	6.30	ND	6.30	ND	6.40	ND	6.20	ND	6.50	ND	6.70	ND	6.50	ND	6.20	ND	6.10	ND	6.20	ND
Aroclor 1248	N/A	N/A	4.20	ND	4.20	ND	4.10	ND	4.20	ND	4.10	ND	4.30	ND	4.40	ND	4.30	ND	4.10	ND	4.00	ND	4.10	ND
Aroclor 1254	N/A	N/A	4.20	ND	4.20	ND	4.10	ND	4.20	ND	4.10	ND	4.30	ND	4.40	ND	4.30	ND	4.10	ND	4.00	ND	4.10	ND
Aroclor 1260	N/A	N/A	4.20	ND	4.20	ND	4.10	ND	4.20	ND	4.10	ND	4.30	ND	4.40	ND	4.30	ND	4.10	ND	4.00	ND	4.10	ND
Total Aroclor	100	25	36.3	ND	36.0	ND	35.5	ND	36.3	ND	35.3	ND	36.9	ND	37.9	ND	36.9	ND	35.2	ND	34.5	ND	35.2	ND
% Moisture	NA	NA	22.0		21.1		20.2		22.1		19.9		22.8		25.0		22.8		19.1		17.9		19.2	
Metals by 6010B [mg/Kg (ppm)]																								
Arsenic	8.2	1	2.79		4.20		3.19		2.66	J	2.7		2.40	J	2.98		2.7		3.29		2.16	J	2.65	
Cadmium	1.2	0.5	0.17	ND	0.17	ND	0.17	ND	0.23	J	0.2	J	0.21	J	0.18	ND	0.2	ND	0.17	ND	0.17	ND	0.17	ND
Copper	33	2.5	1.22	J	0.27		1.14		1.98		1.8		1.23	J	1.09	J	1.0	J	1.28		0.85	J	1.77	
Lead	47	5	2.80		3.15		2.99		5.17		2.2		2.68		3.52		1.8	J	4.16		2.33		1.94	
Mercury	0.17	0.2	0.0036	ND	0.0034	ND	0.0034	ND	0.0039	ND	0.0037	ND	0.0035	ND	0.0036	ND	0.0037	ND	0.0035	ND	0.0036	ND	0.0034	ND
% Moisture	NA	NA	22.0		21.7		20.0		26.1		24.8		21.5		23.3		23.2		18.9		20.0		18.9	
Dioxins/Furans [ng/Kg (pptr)]			**NS**		**NS**		**NS**		**NS**		**NS**		**NS**		**NS**		**NS**		**NS**		**NS**			
2,3,7,8-TCDD	N/A	N/A																					0.0363	JBQ
1,2,3,7,8-PeCDD	N/A	N/A																					0.112	JB
1,2,3,4,7,8-HxCDD	N/A	N/A																					0.0784	JBQ
1,2,3,6,7,8-HxCDD	N/A	N/A																					0.102	JBQ
1,2,3,7,8,9-HxCDD	N/A	N/A																					0.196	JBQ
1,2,3,4,6,7,8-HpCDD	N/A	N/A																					2.60	JB
OCDD	N/A	N/A																					44.5	B
2,3,7,8-TCDF	N/A	N/A																					0.0169	ND
1,2,3,7,8-PeCDF	N/A	N/A																					0.0417	JB
2,3,4,7,8-PeCDF	N/A	N/A																					0.0734	JB
1,2,3,4,7,8-HxCDF	N/A	N/A																					0.0715	JB
1,2,3,6,7,8-HxCDF	N/A	N/A																					0.0406	JB
2,3,4,6,7,8-HxCDF	N/A	N/A																					0.0846	JBQ
1,2,3,7,8,9-HxCDF	N/A	N/A																					0.0779	JB
1,2,3,4,6,7,8-HpCDF	N/A	N/A																					0.318	JB
1,2,3,4,7,8,9-HpCDF	N/A	N/A																					0.0696	JB
OCDF	N/A	N/A																					0.169	JB
DioxinToxicEquivalencyTotal	4.5	2																					0.272	

(1) = NYSDEC TOGS 5.1.9 Class A Threshold for no appreciable concentration
(2) = NYSDEC required detection limit

Key:

µg/Kg = Micrograms per kilogram	B = Detected in method bank
mg/Kg = Milligrams per kilogram	J = Estimated concentration (above detection limit but below quantitative reporting limit)
ng/Kg = Nanograms per kilogram	ND = Not detected
Q = Estimated Maximum Possible Concentration (EMPC)	NS = Not sampled

Sediment Physical Parameters

At each sampling location, sediment samples were measured for salinity and pH using deionized water extraction, as well as total organic carbon (TOC) and percent moisture. The laboratory analyses of the samples on the preferred route resulted in an average pH value of 7.3 ± 0.3 across all sampling locations, with a minimum of 6.9 and a maximum of 7.7. The samples on the alternative route resulted in an average pH value of 7.3 ± 0.3, with a minimum of 6.8 and a maximum of 7.6. TOC, calculated in percent dry weight, was measured to be a mean of 0.07% ± 0.03 on the preferred route and a mean of 0.06% ± 0.02 on alternative route, while salinity was measured to be a mean of 8.3 ppt ± 0.7 on the preferred route and a mean of 8.2 ppt ± 0.6 on the alternative route. Sediment samples had a percent moisture mean of 21.7% ± 2.3 on the preferred route and a mean of 21.9% ± 2.3 on the alternative route.

Metals

Each sediment sample was analyzed for five metals listed in TOGS 5.1.9, including arsenic, cadmium, copper, lead, and mercury. The results of the analyses for these metals, along with the other chemicals analyzed for this report, are summarized in Table 2-3. Positive results were obtained for all of these metals in at least one sample along the preferred route. Positive results were obtained for all metals except mercury in at least one sample along the alternative route. However, none of the metal values exceeded their respective TOGS Class A threshold, except for Sample 11-D0-1E along the preferred route, which had a measured mercury value of 0.224 mg/Kg compared to the threshold of 0.17 mg/Kg.

Semi-Volatile Organic Compounds (SVOCs)

TOGS 5.1.9 sets thresholds for SVOCs based on the sum of all target polycyclic aromatic hydrocarbons (PAHs). Only one SVOC, naphthalene, was detected, and only in one sample (16-D1-4E) on the alternative route. The detected value did not cause the total PAH value in the sample to exceed the corresponding TOGS threshold.

Pesticides

Samples were analyzed for pesticides as the sum of DDT, DDE and DDD, as well as the individual presence of Mirex, Chlordane and Dieldrin. Pesticides were detected at two locations on the preferred route (Samples 9-D0-1E, 9-D1-4E and 11-D0-1E), and one location on the alternative route (Samples 16-D0-1E, 16-D1-4E and 16-D4-6E). However, none of the resultant values exceeded the corresponding TOGS 5.1.9 threshold levels.

Polychlorinated Biphenyls (PCBs)

PCBs, expressed as the sum of Aroclor compounds, were not detected in any sediment samples collected along either the preferred or the alternative pipeline routes.

Volatile Organic Compounds (VOCs)

VOCs are evaluated under TOGS 5.1.9 for Benzene alone, as well as the sum of Benzene, Toluene and Xylene (BTEX). While positive VOC results were obtained for one sample on both pipeline routes (11-D1-4E and B16-D0-1E), none of the resultant values exceeded the corresponding TOGS compound levels.

Dioxin

Dioxin (and Furan) was measured as the combined toxicity equivalent of all target congeners listed in TOGS 5.1.9 with respect to the toxicity of 2,3,7,8 Tetrachlorodibenzo-p-dioxin (TCDD). As stated in the 2009 Sampling and Analysis Plan, dioxin analysis would only be performed on sediment samples containing a high clay or silt content as determined in the field by the sampling team or as required by NYSDEC. Therefore, dioxin analysis was only conducted for one sample, 19-D4-7E, which contained a clay layer. However, no dioxin congeners were detected in the sample.

3 Water Quality Sampling Results

The water quality of the Atlantic Ocean seaward of Rockaway Peninsula is influenced by many physical factors, including sediment inputs and geographic characteristics. Water quality sampling was performed to obtain data regarding background conditions in the water column along both the preferred and alternative pipeline routes. The data were then compared to known water quality values for the Lower New York Bay, including parameters for physical, chemical, and biological components of the water column (NYCDEP 2010). The sampling results are reflective of water quality that has generally been very good for the past 15 years, especially in comparison to other parts of the New York Harbor/Raritan Bat/Jamaica Bay complex (NYCDEP 2010).

Water quality sampling locations were co-located with the eight sediment sampling locations (four on each pipeline route) (see Figure 1-2), and collected on November 29, December 3 and December 10, 2010. Water quality samples were collected from three depth strata at each location (bottom, middle, and surface) using a Whale submersible pump to evaluate the existing quality of the water along the Project routes. The results for each sampling group (physical, chemical and biological) are summarized below. Physical parameters were measured in the field at the time of sampling, except that the amount of suspended and settleable solids were determined in the laboratory along with biological and chemical constituents.

3.1 Physical Parameters of Water Quality

Dissolved Oxygen (DO)

In the last few decades, the Lower New York Bay has experienced a favorable increase in the levels of dissolved oxygen. This can be attributed to various efforts to improve water quality through more stringent regulations on municipal and industrial discharges (O'Shea and Brosnan, 2000). Recent DO levels, as reported in the 2010 New York Harbor Water Quality Report, have illustrated averages between 7.2 mg/L in bottom waters and 7.6 mg/L in surface waters (NYCDEP 2010). Results of data collected during this field effort confirmed DO levels in the survey area within this range and higher (mean = 8.1 mg/L with a range of 6.7 to 9.7 mg/L along the preferred route; mean = 7.6 mg/L with a range of 6.6 to 9.2 mg/L along the alternative route). This exceeds the New York State water quality standard for a minimum daily average of 4.8 mg/L in class SA saline surface waters.

Temperature

The average temperature for water quality samples collected along the preferred route was 10.6 ºC ± 1.0 ºC, and the average temperature for water quality samples collected along the alternative route was 8.6 ºC ± 1.2 ºC. The water quality samples exhibited a range in temperature from 8.8 ºC to 11.9 ºC on the preferred route and 6.8 ºC to 10.0 ºC on the alternative route.

Turbidity

An analysis of turbidity, as well as total suspended solids (TSS), indicated limited variation in these measurements along both routes. The average turbidity measurement across all sampling locations (for all sampling depths) for the preferred route was 2.2 Nephelometric Turbidity Units (NTU), with a range of 0.0 NTU to 9.4 NTU. However, the 9.4 NTU reading, which exceeds the New York State standard of 5.0 NTUs, is an outlier that may reflect unusual sediment disturbance during sampling. The average turbidity measurement for all samples on the alternative route was 0.2 NTU, with a range of 0.0 NTU to 1.2 NTU. TSS values on the preferred route ranged from 1.4 mg/L to 18.0 mg/L, with an average of 5.8 mg/L ± 5.3 mg/L. TSS values on the alternative route ranged from 4.0 mg/L to 38.0 mg/L, with an average of 7.2 mg/L ± 9.7 mg/L. These TSS levels are consistent with 2009-2010 results for the entire Lower New York Bay/Raritan Bay sub-basin, which averaged less than 10 mg/L (NYCDEC 2010). Consistent with New York State standards, these levels are not likely to cause deposition or impair the waters in the Project area for their best usages.

pH

Water samples were measured for pH using a pH electrode. Analyses of the samples across all sampling locations and depths on the preferred route resulted in an average pH value of 8.0 ± 0.1, with a minimum of 7.8 and a maximum of 8.1. On the alternative route, the average pH for all samples was 7.9 ± 0.1, with a minimum of 7.8 and a maximum of 8.2. These values fall within the New York State water quality standard range of 6.4 to 8.6 for pH levels in saline waters.

3.2 Chemical and Biological Parameters of Water Quality

Water quality samples for chemical and biological analyses were collected using an oil-free pump made of inert materials in one-liter volumes from each of the discrete depths at the eight sampling locations, with the exception of biological oxygen demand (BOD) samples, which were collected in 250-milliliter amber glass bottles to protect the integrity of the samples until analysis. Samples were placed on ice and sent to the laboratory on the same day as sample collection to meet holding time requirements. A summary of all water quality analyses performed is presented in Tables 3-1. The water quality sample results are presented in Tables 3-2 and 3-3 (preferred and alternative routes, respectively) and discussed below. The complete analytical results are presented in Appendix B.

Table 3-1 Water Sample Analyses

Test Description	Method Number	Laboratory Reporting Limits (mg/L)*
Turbidity	Field Test	NA
pH	Field Test	NA
Temperature	Field Test	NA
Dissolved Oxygen	Field Test	NA
Total Suspended Solids (TSS)	SM 2540 (D)	4.0
Settleable Solids	SM 2540 (F)	0.10
Chlorides	EPA 300	2
Total Organic Nitrogen	EPA 351.2/SM 4500-NH_3 (B+G)	0.40
Total Phosphorus	EPA 365.3	0.050
Fecal Coliform Bacteria	SM 9220 (D)	NA
Total Coliform Bacteria	SM 9220	NA
Biological Oxygen Demand	SM 5210 (B)	3.4
Chemical Oxygen Demand	SM 5220 (C)	20
Ammonia (as N)	SM 4500-NH_3 (B)	0.20
T. Kjeldahl Nitrogen	EPA 351.2	0.20

*Does not include dilution factors

Biological Parameters

Biological parameters are often evaluated to determine the baseline water quality of a given water body, since parameters such as biological oxygen demand (BOD) may be affected by negative inputs such as raw sewage and other waste products. Water samples were collected and tested for the biological parameters identified in Table 3-1.

In order to evaluate bacteria levels along the proposed pipeline route that may be indicative of increased sewage inputs or elevated nutrient inputs, Transco collected water quality samples for fecal coliforms and total coliform bacteria. The results of the analyses indicated very low levels of fecal and total coliforms, which are consistent with results for the Lower New York Bay/Raritan sub-basin, excluding the waters within two miles of the western end of Coney Island that measured above 100 coliform units per 100 mL (NYCDEP 2010). Coliform was not detected in the majority of samples, though some samples contained 10 to 30 coliform units per 100 mL. These coliform levels are below the NYCDEP standard of 70 total coliform units per 100 mL for class SA saline surface waters (the classification carried by surface waters in the Project area). The results of the laboratory analyses are presented in Appendix B.

Chemical Parameters

Chemical parameters also are evaluated to determine baseline water quality, since parameters such as total phosphorus and nitrogen are often affected by negative inputs like municipal runoff. Water samples were collected and tested for the chemical parameters identified in Table 3-1. Based on the results of the chemical water quality analyses, water quality along the preferred and alternative routes did not appear to be significantly impacted by contaminant inputs from the surrounding coastlines at the time of study, and generally adhere to the New York State water quality requirements. For example, nitrogen and phosphorous were not present at levels that would result in growths of algae, weeds and slimes that would impair the waters for their best usages, nor would calculated unionized ammonia levels exceed the state standard of 0.23 mg/L for class SA saline surface waters. The complete analytical results for all water quality samples are provided in Appendix B.

Table 3-2 Summary of Analytical Results for Water Quality Samples along the Preferred Pipeline Route, Fall 2010

Analyte	Units	Sample ID:												
		09-DS-9W	09-DM-9W	09-DB-9W	11-DS-11W	11-DM-11W	11-DB-11W	13-DS-13W	13-DM-13W	13-DB-13W	15-DS-15W	15-DM-15W	15-DB-15W	15-DB-15W QA/QC
Total Suspended Solids	mg/L	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	16.0	5.0	4.0	18.0	63.0
Settleable Solids	ml/L	0.050	0.050	0.050	0.050	0.050	0.050	0.10	0.10	0.11	0.10	0.11	0.11	0.10
Chloride	mg/L	18,800	19,200	19,300	18,100	18,400	19,400	17,400	18,500	18,800	17,500	18,700	18,700	18,300
Total Organic Nitrogen	mg/L	0.40	0.40	0.40	1.0	1.0		0.40	0.40	0.40	0.40	1.0	0.40	1.0
Total Phosphorus	mg/L as P	2.20	0.059	0.82	0.072	0.14	2.1	1.5	0.050	0.066	0.050	0.050	0.068	1.2
Fecal Coliform	organisms per 100 mL	10	10	10	10	10	10	10	10	10	10	10	20	20
Total Coliform	organisms per 100 mL	10	10	10	10	10	10	10	10	10	10	10	30	10
Biochemical Oxygen Demand	mg/L	2.0	2.0	2.0	2.0	2.0	2.0	15.1	11.9	12.1	14.3	15.5	10.7	26.5
Chemical Oxygen Demand	mg/L	2,020	2,050	2,560	2,070	1,540	2,050	337	699	747	193	651	988	940
Ammonia (as N)	mg/L	0.20	0.20	0.20	0.54	0.81	0.81	0.24	0.35	0.20	0.20	0.53	0.20	0.89
T. Kjeldahl Nitrogen	mg/L as N	0.32	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

Key:
mg/L = Milligrams per Liter
ml/L = Milliliters per Liter

Table 3-3 Summary of Analytical Results for Water Quality Samples along the Alternative Pipeline Route, Fall 2010

Analyte	Units	Sample ID:													
		16-DS-16W	16-DM-16W	16-DB-16W	16-DB-16W QA/QC	B16-DS-B16W	B16-DS-B16W QA/QC	B16-DM-B16W	B16-DB-B16W	B19-DS-B19W	B19-DM-B19W	B19-DB-B19W	19-DS-19W	19-DM-19W	19-DB-19W
Total Suspended Solids	mg/L	4.0	4.0	6.0	7.0	4.0	9.0	4.0	6.0	4.0	4.0	4.0	4.0	4.0	38.0
Settleable Solids	ml/L	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11
Chloride	mg/L	19,100	20,200	20,600	20,100	18,900	19,300	20,000	20,300	18,900	19,700	20,000	18,000	18,300	18,200
Total Organic Nitrogen	mg/L	0.60	0.60	0.60	0.40	0.60	1.0	0.60	0.60	0.60	0.60	0.60	1.0	0.40	0.40
Total Phosphorus	mg/L as P	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.070	0.063	0.28
Fecal Coliform	organisms per 100 mL	10	10	10	N/A	10	10	10	10	10	10	10	10	10	10
Total Coliform	organisms per 100 mL	10	10	10	N/A	10	10	10	20	10	10	30	10	20	20
Biochemical Oxygen Demand	mg/L	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	15.5	11.7	15.5
Chemical Oxygen Demand	mg/L	1,870	1,820	1,920	1,820	1,280	2,190	1,780	1,730	1,550	1,690	1,640	1,040	1,060	699
Ammonia (as N)	mg/L	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.49	0.20	0.20
T. Kjeldahl Nitrogen	mg/L as N	0.40	0.40	0.40	0.40	0.40	0.80	0.40	0.40	0.40	0.40	0.40	0.20	0.20	0.20

Key:
mg/L = Milligrams per Liter
ml/L = Milliliters per Liter

4 Benthic Community Analysis

As part of the field effort, a site-specific baseline benthic survey was conducted with the purpose of ascertaining the health of the existing benthic community along the preferred and alternative pipeline routes and, in combination with the sediment chemical analysis, to assess the overall quality and potential impact from pipeline installation due to physical disturbance, sedimentation, or water quality impacts. Benthic community samples were collected on December 4, 2010 at six (6) locations along the preferred pipeline route and six (6) locations along the alternative pipeline route using a Smith-MacIntyre grab sampler (0.1 square meter; see Figure 4-1). These single-sample locations were located approximately 0.4 miles apart along each route. An additional benthic sample was collected in an area of high sonar reflectivity (indicating possible hardbottom habitat) discovered during geophysical surveys. Drop-camera video was also collected at each sampling location for qualitative analysis of the benthic community.

Generally, the sediment type within the survey area is primarily sand with small amounts (less than 10%) of gravel, silt and clay. The benthic communities in the survey area on both routes are dominated by organisms in the classes Polychaeta, Bavalvia and Crustacea. Along the preferred route, samples at each location were dominated by the Atlantic surf-clam (*Spisula solidissima*), an amphipod (*Protohaustorius* sp.) and polychaetes (*Polygoridius* sp. and *Tharyx* sp.) (See Table 4-1). Along the alternative route, samples at each location were dominated by the Atlantic surf-clam and polychaetes (*Tharyx* sp. and *Nephtys bucera*). Video observations identified Asteroidea (starfish) on the substrate surface at most of the sampling stations, as well as egg casings of a gastropod (*Lunatia* sp.) and Pagurid (hermit) crabs along both pipeline routes. Along both routes, total population of the class Bivalvia exhibited a bell-shaped curve, with lower abundance at nearshore and offshore stations and peak abundance at intermediate stations. Organisms of the classes Polychaeta and Crustacea showed inverse trends compared to the bivalves, with higher percent abundance at nearshore and offshore stations and lower values at intermediate stations. A complete list of taxa collected at each station is provided in Appendix C, Benthic Identification Spreadsheets.

Table 4-1 Benthic Data Results Summary for Preferred and Alternative Pipeline Routes, Fall 2010

Measurement	B14 (Preferred)	B20 (Alternative)	Average
Depth (ft)	27	27	27
Total # of Organisms Identified	73	208	140.5
Taxa Richness	11	19	15
Diversity (H^1)	1.85	2.03	1.94
Evenness	1.78	1.59	1.69

Notes:
dominanat species preferred route = at least 50% of sample when totaled
Protohaustorius sp., Tharyx sp.
dominanat species alternate route = at least 50% of sample when totaled
Tharyx sp., Nichomache lumbricalis

Measurement	B13 (Preferred)	B19 (Alternative)	Average
Depth (ft)	30	31	30.5
Total # of Organisms Identified	107	123	115
Taxa Richness	16	14	15
Diversity (H^1)	1.34	1.51	1.43
Evenness	1.12	1.31	1.22

Notes:
dominanat species preferred route = at least 50% of sample when totaled
Spisula solidissima
dominanat species alternate route = at least 50% of sample when totaled
Tharyx sp., Polygordius sp.

Measurement	B12 (Preferred)	B18 (Alternative)	Average
Depth (ft)	33	35	34
Total # of Organisms Identified	69	70	69.5
Taxa Richness	13	12	12.5
Diversity (H^1)	1.85	1.62	1.74
Evenness	1.66	1.50	1.58

Notes:
dominanat species preferred route = at least 50% of sample when totaled
Spisula solidissima, Nephtys bucera
dominanat species alternate route = at least 50% of sample when totaled
Spisula solidissima

Measurement	B11 (Preferred)	B17 (Alternative)	Average
Depth (ft)	38	36	37
Total # of Organisms Identified	129	120	124.5
Taxa Richness	16	15	15.5
Diversity (H^1)	2.05	1.34	1.70
Evenness	1.70	1.14	1.42

Notes:
dominanat species preferred route = at least 50% of sample when totaled
Spisula solidissima, Tharyx sp., Nephtys bucera
dominanat species alternate route = at least 50% of sample when totaled
Spisula solidissima

Table 4-1 Benthic Data Results Summary for Preferred and Alternative Pipeline Routes, Fall 2010

Measurement	B10 (Preferred)	B16 (Alternative)	Average
Depth (ft)	38	35	36.5
Total # of Organisms Identified	115	69	92
Taxa Richness	22	14	18
Diversity (H^1)	1.75	1.86	1.81
Evenness	1.30	1.62	1.46

Notes:
dominanat species preferred route = at least 50% of sample when totaled
Polygordius sp., Tharyx sp., Spisula solidissima
dominanat species alternate route = at least 50% of sample when totaled
Nephtys bucera, Spisula solidissima, Protohaustrorius sp.

Measurement	B9 (Preferred)	B15 (Alternative)	Average
Depth (ft)	38	39	38.5
Total # of Organisms Identified	102	81	91.5
Taxa Richness	17	22	19.5
Diversity (H^1)	2.12	2.65	2.39
Evenness	1.72	1.98	1.85

Notes:
dominanat species preferred route = at least 50% of sample when totaled
Protohaustorius sp., Magelona sp., Nephtys bucera
dominanat species alternate route = at least 50% of sample when totaled
Nephtys bucera, Magelona sp., Tharyx sp.

While not identified along the preferred and alternative routes during the 2010 survey, anthropogenic debris and artificial reef structures provide hardbottom habitat within the Project study area (see Figure 4-1). From the 2009 survey, epibenthic communities colonizing such hardbottom areas were predominantly composed of the northern star coral *Astrangia poculata* (E & E 2009).

Diversity was assessed using Shannon's Diversity Index (*H*). Average diversity estimates were similar across sampling locations along the preferred and alternative routes (mean $H = 1.8 \pm 0.3$ for preferred route; mean $H = 1.9 \pm 0.5$ for alternative route). Diversity estimates did not appear to be affected by sediment type, as all sampling locations had similar substrate, or depth. Diversity estimates, ranging from 1.3 to 2.7, did not show a definitive trend associated with distance from shore for either route, but there appears to be a slightly inverse correlation between diversity and bivalve abundance (i.e., the correlation coefficient (R) is equal to -0.60). These results contrast with the results from the September 2009 survey conducted nearby, where the trend for diversity clearly increased as distance from shore increased. The previous diversity trend was related to a dominant nearshore population of the amphipod *Rhepoxynius epistomus*. In contrast, no *R. epistomus* individuals were identified in any samples during the December 2010 survey. This suggests that zonation of benthic infauna is not strongly related to wave disturbance at the sampled depths (between -20 feet and -40 feet MLLW), but that seasonal conditions (e.g., higher temperature, light availability and/or salinity) may have promoted a temporary spike in the nearshore *R. epistomus* population in 2009. Similar temporal fluctuations in nearshore benthic populations have been observed in other studies along the east coast (e.g., Posey and Alphin 2002; Charvat, Nelson and Allenbaugh 1990). This demonstrates that if monitoring for impacts to benthic fauna will be required, then control stations will be critical in determining Project-related effects, and that pre-construction/baseline monitoring and post-construction monitoring should be conducted during the same seasons if possible.

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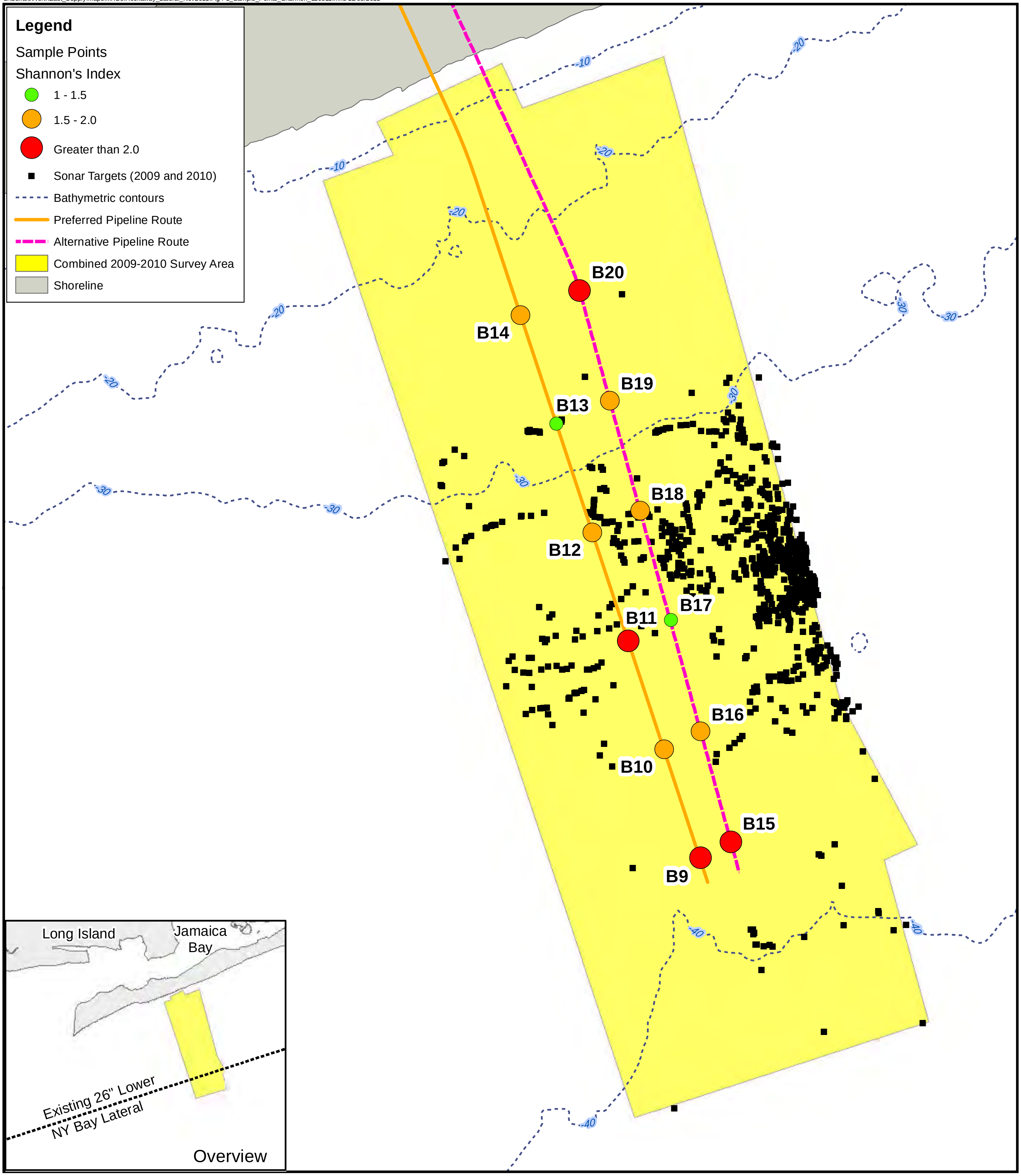

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Feet

Figure 4-1
Shannon's Index Benthic Sampling Locations
Fall 2010 Field Survey
Rockaway Delivery Lateral
Williams Transco

N

5 Drop Camera Video

A video of the bottom was obtained for the 12 sampling locations indicated on Figure 4-1 and analyzed to supplement the benthic sampling data. To collect videos of the bottom, a drop camera was lowered to the depth specified for the specific sample location. The drop camera was allowed to stabilize in the water column until it remained steady enough to obtain a good image. An onboard monitor was used to ensure that the camera was steady and to make initial observations of the benthic community. Once the image was steady, a slow drift across the bottom captured the bottom video for that location. A CD containing the drop camera video is provided in Appendix D.

Underwater video observations are best used to supplement existing benthic data. Due to camera movement, shadows, camera magnification, technical problems with the camera light and video quality, it is often difficult to confirm species identification and to determine abundances. Specific observations resulting from the analysis of the videos has been incorporated into the discussions in Section 4.

6 References

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The appendices/attachments to this document are available for viewing on the FERC website (http://www.ferc.gov). Using the “eLibrary” link, select “General Search” from the eLibrary menu, enter the selected date range and Docket No. CP13-36 (Transco’s application), and follow the instructions. For assistance, please call 1-866-208-3676, or e-mail FERCOnlineSupport@ferc.gov.